

REMARKS/ARGUMENTS

Applicants appreciate the thorough examination of the present application, as evidenced by the first Official Action. The Official Action objects to the drawings under 37 C.F.R. 1.83(a) for failing to show every feature of the invention. More particularly, the Official Action alleged that the drawings fail to show the transceiver, as recited in Claims 7-11. The Official Action also rejects Claims 1-20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,717,795 to Sharma et al. In addition, the Official Action rejects Claims 21-26 under 35 U.S.C. § 103(a) as being unpatentable over the Sharma patent, in view of U.S. Patent No. 4,089,584 to Polczynski.

In response to the Official Action, Applicants have amended FIG. 1 to include transceiver 66. Accordingly, Applicants have also amended the specification of the present application to include the callout for the transceiver. Applicants note that as the transceiver added to FIG. 1 merely illustrates a combination of the elements (e.g., multiplexer 14, demultiplexer 18, optical sources 22, optical detectors 24) disclosed in the specification of the present application, no new matter has been added to the present application by virtue of the amendment to FIG. 1 or the accompanying amendment to the specification. Thus, Applicants respectfully submit that the objection to the drawings is overcome.

Applicants have not amended any of the pending claims of the present application in response to the rejection of such claims as being unpatentable over, the Sharma patent or the combination of the Sharma patent and the Polczynski patent. As explained below, Applicants respectfully submit that the claimed invention of the present application is patentably distinct from the Sharma and Polczynski patents, taken individually or in combination. As such, Applicants respectfully traverse the rejection of Claims 1-20 as being unpatentable over the Sharma patent; and the rejection of Claims 21-26 as being unpatentable over the Sharma patent, in view of the Polczynski patent. In view of the amendments to the drawings and specification, and the remarks presented herein, Applicants respectfully request reconsideration and allowance of all of the pending claims of the present application.

A. Claims 1-20 are Patentable over Sharma

The primary reference cited against the claimed invention, the Sharma patent, discloses an optical wavelength division multiplexed network system that permits optical communications between any of a plurality of nodes via a main trunk line. As disclosed, the network system includes a plurality of nodes interconnected by an optical fiber in a ring form and includes a multi-wavelength light source for multiplexing and transmitting a plurality of lights having different wavelengths. Each of the nodes includes an add-drop multiplexer for extracting light of a particular wavelength among the lights of a plurality of wavelengths transmitted via the main trunk line into the node, and for inserting the light of the preset wavelength from the node into the main trunk line. Each node also includes at least one optical receiver for receiving part of the light extracted by the add-drop multiplexer, and a modulator for modulating light extracted by add-drop multiplexer with data to be transmitted and sending the light back to the add-drop multiplexer and on to the main trunk line.

Independent Claim 1 of the present application provides a closed-loop optical network system. As recited, the system includes a multi-mode network bus for transmitting a plurality of optical signals, and a multiplexer capable of wavelength division multiplexing a plurality of input optical signals for transmission via the network bus, where the input optical signals have predetermined optical wavelengths. The system also includes a plurality of remote devices optically connected to the network bus. The remote devices are capable of reading optical signals having respective predefined optical wavelengths off of the network bus, and capable of writing optical signals having respective predefined optical wavelengths onto the network bus. In addition to the multi-mode network bus, multiplexer and remote devices, the system of independent Claim 1 also includes a demultiplexer capable of receiving optical signals having at least one of the predetermined optical wavelengths from the network bus, and thereafter wavelength division demultiplexing the optical signals into output optical signals.

In contrast to the system of independent Claim 1, and as conceded by the first Official Action, the Sharma patent does not disclose a multi-mode network bus. Nonetheless, the Official Action alleges that, in an alternative to the embodiment alleged to disclose the other elements of the independent Claim 1 (i.e., embodiment shown in FIG. 15), the Sharma patent

discloses the use of a multi-mode light source. The Official Action continues by alleging that it would have been obvious to have used the multi-mode light source in the embodiment disclosing the other features of Claim 1 since multi-mode light sources are less expensive than single-mode light sources. Further, the Official Action alleges that it would have further been obvious to one skilled in the art to use a multi-mode network bus to provide compatibility for the multi-mode light source.

Applicants respectfully submit, however, that multi-mode as the term is used to describe the light source in the Sharma patent differs from multi-mode as the term is used to describe the multi-mode network bus, as understood by those skilled in the art. In this regard, the Sharma patent discloses that the multi-mode light source emits laser light “corresponding to a plurality of longitudinal modes at a fixed wavelength interval.” Sharma Patent, col. 6, ll. 42-43 (emphasis added). As readily understood by those skilled in the art, however, a multi-mode network bus transmitting optical signals, as recited by independent Claim 1, operates in multiple transverse modes. More particularly, as is well known to those skilled in the art, light sources such as lasers are capable of operating in one or more transverse modes (having a field vector normal to the direction of propagation) and one or more longitudinal modes (having a field vector parallel to the direction of propagation). By operating in multiple longitudinal modes, however, a light source is capable of producing multiple frequencies.

In contrast to light sources, network buses (waveguides, optical fibers, etc.) transmitting optical signals are typically characterized by one or more transverse modes. For each transverse mode, a standing wave is established in a direction normal to the direction of propagation, where higher mode optical signals are generally characterized by sharper guiding angles and a smaller propagation constant in the direction of propagation, as compared to lower mode optical signals. Thus, the mode of the light source disclosed by the Sharma patent refers to the longitudinal mode to produce multiple wavelengths. In contrast, the mode of the network bus recited by independent Claim 1 refers to the transverse mode which, because the network bus is multimode (generally having a larger waveguide diameter), permits multiple standing waves to be established in a direction perpendicular to the direction of propagation.

Applicant therefore respectfully submits that even considering the multimode light source disclosed by the Sharma patent, the Sharma patent does not teach or suggest a multimode network bus, as recited by independent Claim 1 of the present application. As the multimode light source of the Sharma patent operates in multiple longitudinal modes, the multimode light source could equally provide optical signals to a single mode network bus or a multimode network bus. And while the Sharma patent does not explicitly define its network bus as being single mode or multimode, the Sharma patent suggests that the network bus is, in fact, a single mode network bus, in contrast to the network bus of independent Claim 1. In this regard, the Sharma patent discloses the use of related network systems being proposed for optical telecommunication. As is well known to those skilled in the art, due to increased modal dispersion in multimode waveguides, optical telecommunication networks are most typically, if not exclusively, implemented using single mode waveguides. Moreover, as shown and described with respect to FIGS. 8, 9 and 10 of the Sharma patent, the network nodes of various embodiments of the Sharma system include optical circulators (see, e.g., optical circulators **618**, **6111** of FIG. 8). And as is also well known to those skilled in the art, optical circulators are primarily used with single mode waveguides.

Applicants therefore respectfully submit that, in contrast to independent Claim 1 of the present application, the Sharma patent does not teach or suggest a closed-loop optical network system including a multimode network bus for transmitting a plurality of optical signals. As such, the network system of independent Claim 1, and by dependency Claims 2-6, is patentably distinct from the system of the Sharma patent. Applicants also respectfully submit that the transceiver and method of independent Claims 7 and 12, respectively, also recite a multi-mode network bus for transmitting optical signals. Thus, Applicants also respectfully submit that the transceiver of independent Claim 1, and by dependency Claims 8-11, and the method of independent Claim 12, and by dependency Claims 13-20, are patentably distinct from the system and method of the Sharma patent for at least the same reasons given above with respect to independent Claim 1. Applicants further respectfully submit, then, that the rejection of Claims 1-20 under 35 U.S.C. § 103(a) as being unpatentable over the Sharma patent, is overcome.

B. Claims 21-26 are Patentable over Sharma/Polczynski

Independent Claim 21 of the present application provides a vehicle adapted to support optical communications, where the vehicle includes a body and a closed-loop optical network system. The optical network system, in turn, includes a multimode network bus, a multiplexer, a plurality of remote devices and a demultiplexer, where the network bus and remote devices are optically connected to one another and disposed at least partially throughout the vehicle body. Similar to independent Claim 1, the multiplexer is capable of wavelength division multiplexing a plurality of input optical signals (having a plurality of optical wavelengths) for transmission via the network bus. The remote devices are capable of writing and reading optical signals having respective optical wavelengths to and from the network bus. The demultiplexer, then, is capable of receiving optical signals having at least one of the optical wavelengths from the network bus and thereafter wavelength division demultiplexing the optical signals into a plurality of output optical signals.

As indicated above, the Official Action rejects independent Claim 21, as well as dependent Claims 22-26, as being unpatentable over the Sharma patent, in view of the Polczynski patent. More particularly, in a manner similar to that of independent Claim 1, the Official Action alleges that the Sharma patent discloses an optical network system including a multimode network bus, a multiplexer, a plurality of remote devices and a demultiplexer. However, as conceded by the Official Action, the Sharma patent does not disclose the network for use in a vehicle, which the Official Action alleges is disclosed by the Polczynski patent. The Official Action continues by alleging that it would have been obvious to use the optical network of the Sharma patent in a vehicle as disclosed by the Polczynski patent to provide the benefits of immunity to electromagnetic interference and obviate the need for radiation shielding for the vehicle.

As explained above with respect to independent Claim 1, the Sharma patent does not teach or suggest an optical network including a multi-mode network bus. In fact, the Sharma patent appears to disclose that its optical network is a single mode network including a single mode network bus. And even if it could be suggested that the Polczynski patent disclosed a multimode network bus, Applicants respectfully submit that the Sharma and Polczynski patents

cannot properly be combined to teach or suggest the claimed invention. In this regard, whereas the Sharma patent discloses a frequency division multiplexed (FDM) system, the Polczynski patent discloses a time division multiplexed (TDM) system. Thus, Applicants respectfully submit that to modify the Sharma system to include teachings of the Polczynski system would require a significant alteration of the FDM system disclosed by the Sharma patent in a manner that changes the principle of operation of the system. And as stated in M.P.E.P. § 2143.01, “[a] proposed modification cannot change the principle of operation of a reference.” Moreover, Applicants respectfully submit that the motivation to combine the Sharma and Polczynski systems arise from the fact that those systems include optical networks since the advantages provided by the Official Action are those of using optical networks over electrical networks. But since both the Sharma and Polczynski systems already individually describe optical networks, one skilled in the art would not have to modify either system to achieve the advantages provided by the Official Action.

Applicants therefore respectfully submit that the claimed invention of independent Claim 21 is patentably distinct from the system and method of the Sharma patent and the Polczynski patent, taken individually or in combination. As dependent Claims 22-26 each depend, directly or indirectly, from independent Claim 21, Applicants also respectfully submit that dependent Claims 22-26 are patentably distinct from the system and method of the Sharma patent and the Polczynski patent for at least the same reasons given above with respect to independent Claim 21. Applicants further respectfully submit, then, that the rejection of Claims 21-26 under 35 U.S.C. § 103(a) as being unpatentable over the Sharma patent, in view of the Polczynski patent, is overcome.

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CONCLUSION

In view of the amendments to the drawings and specification, and the remarks presented above, Applicants respectfully submit that the present application is in condition for allowance. As such, the issuance of a Notice of Allowance is therefore respectfully requested. In order to expedite the examination of the present application, the Examiner is encouraged to contact Applicants' undersigned attorney in order to resolve any remaining issues.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,




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APPENDIX

1. Annotated Sheet Showing Changes (FIG. 1)
2. Replacement Sheets (FIGS. 1-3)

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Amendments to the Drawings:

The enclosed sheets of formal drawings, which include FIGS. 1-3, replaces the original sheets including FIGS. 1-3. In view of the Official Action's objection to the drawings under 37 C.F.R. 1.83(a) as not showing every feature of the invention specified in the claims, in the attached replacement drawing sheet including FIG. 1, previously omitted transceiver 64 has been added. An annotated drawing sheet including FIG. 1 is also enclosed to illustrate the added transceiver.



ANNOTATED SHEET

1/3

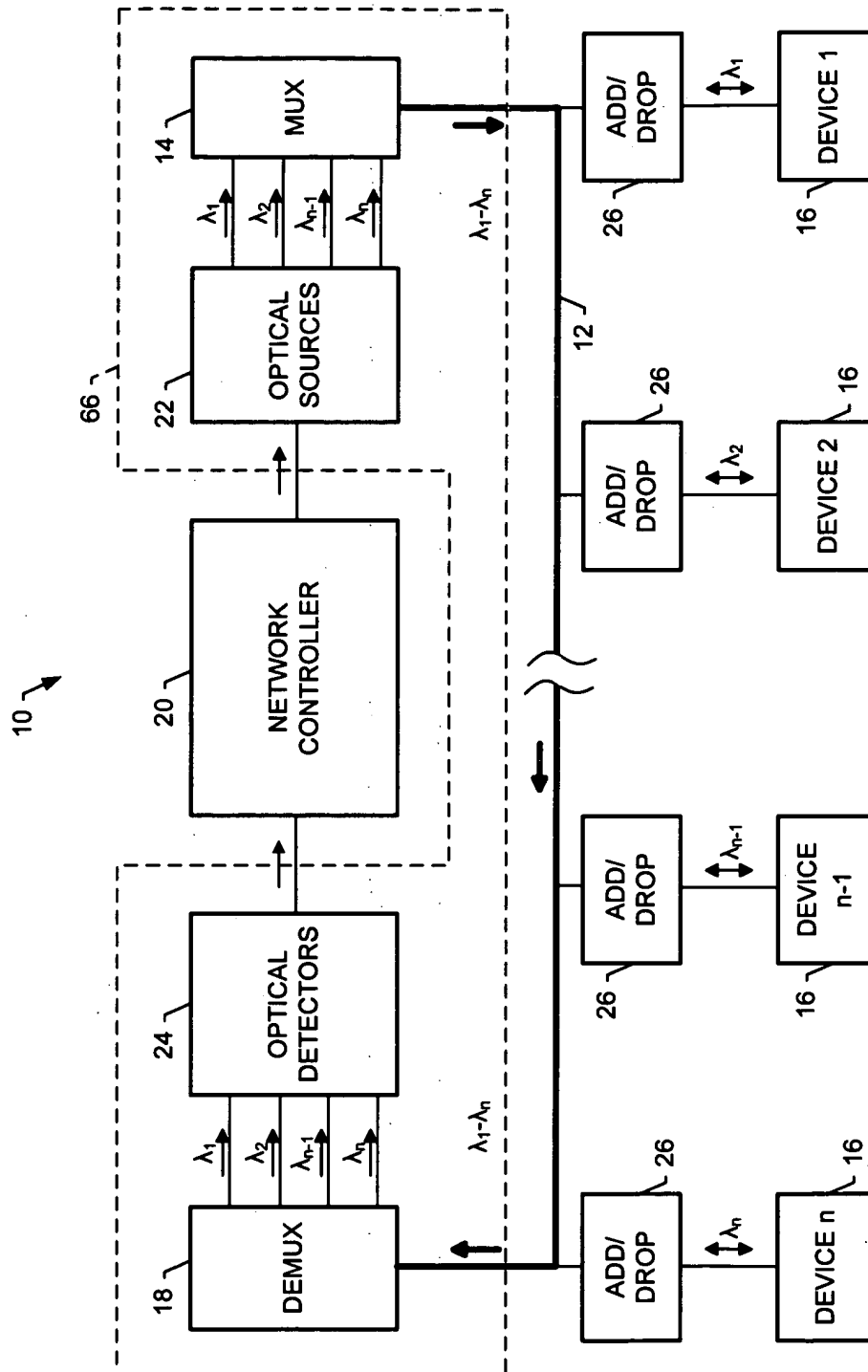


FIG. 1